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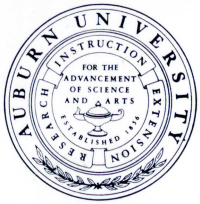

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GEOLOGICAL SURVEY OF ALABAMA
EUGENE ALLEN SMITH, *State Geologist*

BULLETIN No. 15.

STATISTICS OF THE MINERAL PRODUCTION OF ALABAMA FOR 1913

COMPILED FROM MINERAL RESOURCES OF THE UNITED STATES

By
CHARLES ARTHUR ABELE

UNIVERSITY, ALABAMA
1914

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LETTER OF TRANSMITTAL.

UNIVERSITY, ALA., December, 1914.

HON. EMMET O'NEAL,
Governor of Alabama,
Montgomery, Ala.

SIR:—I have the honor to transmit herewith the manuscript of a Report on the Mineral Production of Alabama for the year 1913, with the request that it be printed as Bulletin No. 15 of the Geological Survey of Alabama.

Very respectfully,

EUGENE A. SMITH,
State Geologist.

GEOLOGICAL CORPS.

Eugene Allen Smith, Ph. D.	State Geologist
William F. Prouty, Ph. D.	Chief Assistant
S. J. Lloyd, Ph. D.	Assistant
Robert S. Hodges	Chemist
Herbert H. Smith	Curator of Museum
Roland M. Harper, Ph. D.	Botanist
George N. Brewer	Field Assistant
A. T. Donoho	Stenographer

RIVER GAGE HEIGHT OBSERVERS.

C. J. Stowe	Jackson's Gap, Tallapoosa River
J. E. Whitehead	Riverside, Coosa River
S. T. Willard	Beck, Conecuh River
Ed. Bullen	Red Bay, Big Bear Creek
E. Cummings	Wedowee, Little Tallapoosa River

From the records of daily observations of the gage readings at these places when extended through sufficient time, the calculations of available horsepower to be obtained from the different streams is made.

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PREFACE.

The statistics of all the minerals included in the following pages have been collected in cooperation with the United States Geological Survey, and have been compiled from advance chapters of the *Mineral Resources of the United States*, a publication of the Federal Survey.

The introductory and general matter in each of these articles has either been taken without change from the U. S. advance chapters or has been rearranged or condensed from these chapters, or entirely rewritten to suit it for our present purposes. In each case credit is given to the author.

INTRODUCTION.

By E. W. Parker, Statistician, U. S. G. S.

WITH iron ore considered as the basis of iron production, Alabama ranks eighteenth among all the States in the value of its mineral products, and second among the States south of Mason and Dixon's line and Ohio River. If pig iron were taken as the basis of iron production, Alabama would rank about fifteenth among all the States, but would maintain the position it now holds among the Southern States. West Virginia, with its great production of mineral fuel—coal, petroleum, and natural gas—is the premier mineral producer among the Southern States. Alabama is not distinguished as the leading producer in any important mineral substance, but it ranks third in the production of iron ore, fifth in the production of pig iron, second in quantity and third in value in the production of coke, and sixth in quantity and fifth in value as a producer of coal. Considerable progress has been made in the development of the clay-working and quarrying industries, but these resources have not been exploited to the same extent as those of coal and iron.

The rise of Alabama as a mining and industrial Commonwealth had its beginning in the last quarter of the nineteenth century following the development in 1882 of the extensive deposits of iron ore in the vicinity of Birmingham and contiguous to the already partially known and developed coal fields. The boom and speculative fever which followed was one of the most spectacular incidents in the industrial development of the United States, paralleled only by the rushes which followed Marshall's discovery of gold in California, the exploitation of the Comstock lode in Nevada, and the later rush to the Alaskan gold fields. The speculative fever reached its climax in 1885, and was followed by a period of relapse and liquidation which lasted two years. There was beneath the Birmingham craze, however a substantial foundation for legitimate industrial development, and after the bursting of the original bubble there

has followed more than a quarter of a century of steady healthful growth. The iron ores of Alabama, while inferior to those of Lake Superior, have a compensating advantage in the deposits of good coking coal, and of the limestone requisite for fluxing in the immediate vicinity, as the result of which Birmingham, the Pittsburgh of the South, can manufacture pig iron cheaper than any other district in the world. The iron ores are principally non-Bessemer hematites, and steel is produced chiefly by the open-hearth process. Prior to 1882 when the boom began, the coal production of Alabama had not amounted to as much as half a million tons in any one year. In 1885 it was nearly 2,500,000 tons, but in the collapse of 1886 that followed it decreased to 1,800,000. Since 1886 it has shown an almost unbroken series of annual increases in the production and reached its maximum of 17,678,522 tons in 1913, an increase of more than 1,500,000 tons over 1912, and exceeded, by approximately the same quantity, the previous maximum record made in 1910. The value of the coal product of Alabama is approximately two-thirds that of the total mineral output, and amounted in 1913 to $23,083,724.

In 1882 Alabama produced about 100,000 long tons of pig iron. In 1913 the marketed production of pig iron in Alabama amounted to 1,924,762 long tons, valued at $23,242.374, a slight decrease in quantity from 1912 and an increase in value of nearly $2,000,000. The value of the pig iron produced in Alabama in both 1912 and 1913 was slightly in excess of the value of the coal mined. Although the production of pig iron in 1913 was less than in 1912, there was an increase in the production of iron ore from 4,776,545 tons in 1912, valued at $5,734,371, to 5,333,218 long tons, valued at $6,648,569, in 1913. The value of this iron-ore production, not the value of the pig iron, is used in making up the total value of the mineral products of the State.

The coke production of Alabama increased from 2,975,489 short tons, valued at $8,098,412, in 1912 to 3,323,664 short tons, valued at $9,627,170, in 1913. The increase in the production of iron ore and in the manufacture of coke with the decreased sales of pig iron, indicate that some of the ore and of the coke was sent to furnaces outside of the State, although in addition to the actual marketed production of pig iron there was an

increase in stock carried over to January 1, 1914, as compared with stocks on hand January 1, 1913.

The total value of the mineral production of Alabama, exclusive of the value of the pig iron and including the value of the iron ores, was $34,660,545 in 1913, compared with $30,641,983 in 1912, of which, as already stated, approximately two-thirds is represented by the output of the coal mines. Nearly one-fifth of the total value was contributed by the iron mines. The increase in 1913 over 1912 was $4,018,562, or 13 per cent. The principal coal-producing counties are Jefferson, Walker, Bibb, and Tuscaloosa in the order named. The principal iron ore counties are Jefferson, Tuscaloosa, Etowah and Franklin. The iron-making industry is centered in Birmingham and vicinity. The combined value of the pig iron and coke made in Alabama approximates $33,000,000. These values are not included in the total as they are represented in the value of the iron ore and the coal produced. The clay-working industries yielded products in 1913 valued at $2,091,581, against $1,935,179 in 1912, the principal part of which is from the manufacture of common brick. This does not include the value of raw clay sold, which in 1913 amounted to $53,419. The center of the clay-working industry is in Jefferson County, and Birmingham furnishes the principal market. Vitrified, front, and fire brick represent a value approximating that of common brick alone, and the total output of the brickyards makes up nearly 80 per cent of the State's total clay products. All of the fire brick produced in the State is reported from Jefferson County and all of the vitrified brick is from Jefferson and St. Clair counties. Clay pits for the manufacture of common brick have been opened in one or more places in 38 different counties. The quarry products, the larger part of which is limestone, were valued in 1913 at $1,285,944, an increase of more than 50 per cent from $842,300 in 1912. The increased production in 1913 was in the output of limestone for flux and concrete work, sandstone for use in Government improvements on Warrior River, and the production of marble. Two-thirds of the total value of the stone production is limestone. The most important use of the limestone is for blast furnace flux, with riprap, road making, and crushed stone following in the order named. Little of the Alabama limestone is used for

building at the present time, but in the opinion of Dr. Eugene A. Smith this use is on the increase and is due to the development of an oolitic limestone similar in appearance and composition to the Indiana stone. This stone is of light-gray color, uniform grain, and homogeneous texture. It possesses the quality of cheapness and can be cut to any design required. Marble holds second place in the value of the quarry products, a beautiful white marble occurring in Coosa and Talladega counties being used extensively for building, and black marble which gives promise of future development has been prospected near Anniston. The cement production of Alabama amounted in 1913 to 823,246 barrels, valued at $685,422, against 726,688 barrels, valued at $608,620, in 1912. The lime production is not included in that of the limestone, and amounted to 75,468 short tons, valued at $290,394 in 1913, a decrease from 79,957 short tons, valued at $297,178, in 1912. Alabama produces a small quantity of gold and silver, and other minor products are bauxite, graphite, mica, millstones, mineral paints (natural pigments), mineral waters, natural gas, and sand and gravel.

In the following table is presented a comparison of the mineral output of Alabama in 1912 and 1913. As stated above, the total does not include the value of pig iron nor that of coke, but it does include the value of the coal made into coke and of the iron ore sold or used:

Mineral production of Alabama in 1912 and 1913.

PRODUCT	1912				1913			
	Raw		Derived		Raw		Derived	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Bauxite long tons	14,173	$60,254			(*)	(*)		
Cement, barrels			726,688	$608,620			823,246	$685,422
Clay products, short tons	43,052	†33,414		1,935,179	49,901	†$53,419		2,091,581
Coal, short tons	16,100,600	20,829,252			17,678,522	23,083,724		
Coke, short tons			2,975,489	†8,098,412			3,323,664	†9,627,170
Gold, fine ounces (troy)			809	16,724			537	11,094
Graphite, crystalline, pounds	(*)	(*)			2,020,910	87,336		
Iron ore, long tons	4,776,545	5,734,371			5,333,218	6,648,569		
Iron, pig, long tons			1,987,753	†21,371,053			1,924,762	† 23,242,374
Lime, short tons			79,957	297,178			75,468	290,394
Mica								(*)
Millstones				(*)				(*)
Mineral paints, natural pigments, short tons							(*)	(*)
Mineral waters, gallons sold	165,678	20,435			169,687	19,343		
Natural gas		(*)				(*)		
Sand and gravel, short tons	852,943	268,111			1,405,068	398,088		
Silver, fine ounces (troy)			168	103			117	71
Stone		(‡)		‡842,300		(‡)		‡ 1,285,944
Miscellaneous		(‡)		‡29,456		46,618		12,361
Total value, eliminating duplications	$30,641,983				$34,660,545			

*Value included under "Miscellaneous." †Value not included in total value. ‡Raw product included under derived product.

STATISTICS OF THE MINERAL PRODUCTION OF ALABAMA FOR 1913.

ABRASIVES.

EUGENE A. SMITH.

ALABAMA'S production of abrasives is at present limited to a small number of millstones quarried and made at Dutton, Jackson County; there are, however, several materials in different parts of the State which are sufficiently promising to be worth investigation and thorough testing; the nature and locality of these deposits were treated in Bulletin No. 13, which see.

BARYTES.

So far as known, no barytes has been produced from Alabama mines since 1906. There are some deposits which probably could be worked in Calhoun, Etowah, and St. Clair Counties, in the northeastern part of the State, and in Bibb County, near the center. The residual deposits so far worked are associated with the Chickamauga ("Pelham") limestone, of Ordovician age, and the Knox dolomite, of Cambrian and Ordovician age. They seem to be localized along lines of folding and faulting of the rocks, particularly along the eastern side of the Appalachian fold. The barytes probably occured originally as veins and replacements along fissured or fractured dolomite. Solution of the dolomite has left the insoluble barium sulphate in nodules and bowlders in the residual clay.

BAUXITE.

The production of bauxite in Alabama for 1913 was limited to one producer, which accounts for the decrease and also for the joining of the Alabama and Georgia totals.

The following table gives the production and value of bauxite from 1889 to 1913, inclusive:

Production of bauxite in the United States, 1889-1913, by States, in long tons.

Year	Georgia	Alabama	Arkansas	Total	Value
1889	728	.....	.....	728	$2,366
1890	1,844	.....	.....	1,844	6,012
1891	3,301	292	.....	3,593	11,675
1892	5,110	5,408	.....	10,518	34,183
1893	2,415	6,764	.....	9,179	29,507
1894	2,050	9,016	.....	11,066	35,818
1895	3,756	13,313	.....	17,069	44,000
1896	7,313	11,051	.....	18,364	47,338
1897	7,507	13,083	.....	20,590	57,652
1898	.....	.....	.....	25,149	75,437
1899	15,736	14,499	5,045	35,280	125,598
1900	19,739		3,445	23,184	89,676
1901	18,038		867	18,905	79,914
1902	22,677		4,645	27,322	120,366
1903	22,374		25,713	48,087	171,306
1904	21,913		25,748	47,661	235,704
1905	15,173		32,956	48,129	240,292
1906	25,065		50,267	75,332	368,311
1907	.....		.....	*97,776	480,330
1908	14,464		*37,703	52,167	263,968
1909	22,227		*106,874	129,101*	679,447
1910	33,096		*115,836	148,932	716,258
1911	30,170		*125,448	155,618	750,649
1912	19,587	14,173	*126,105	159,865	768,932
1913	27,409		*182,832	210,241	997,698

*Production of Tennessee included.

For an outline of the uses of bauxite, see Bulletin No. 13.

CEMENT.

EUGENE A. SMITH.
E. F. BURCHARD.

PUZZOLAN OR SLAG CEMENT.

DURING the past six years only one establishment in Alabama has been engaged in the manufacture of slag cement, using the material from the furnaces about Birmingham. The production is included in the returns for Portland cement and cannot be given separately.

PORTLAND CEMENT.

RESOURCES.

Alabama contains large supplies of limestone, chalk, clay and shale well adapted for Portland Cement manufacture, and widely distributed throughout the State. Coal and labor are abundant and cheap, transportation facilities are excellent, and many of the best limestone and chalk localities are situated on navigable rivers, giving ready access and cheap water transportation to Galveston, New Orleans, Mobile, Charleston, and other ports of the Gulf and Atlantic Coasts. This advantage of location will be immensely increased with the opening of the Panama Canal for cement plants located in Alabama will be more than a thousand miles nearer to the Isthmus than their nearest possible competitors

The limestones and shales of the northern part of the State lie so close to each other, and above all so close to the great coal mines which must supply the fuel, that the establishment of Portland Cement plants near the coal mines would give to this industry in Alabama the same advantages which the proximity of the iron ore, the coal, and the stone has given to the iron industry, and which has placed our State beyond competition.

As a Portland cement mixture, ready for burning, consists approximately of 75 per cent. lime carbonate and 25 per cent. of clayey matter, the material furnishing the lime carbonate is necessarily of more economic importance than that from which the silica and alumina are derived. In consequence, a Portland cement plant is usually located in the immediate vicinity of a suitable limestone, while the clay or shale required to complete the mixture may be brought some distance.

The limestone formations in North Alabama which can supply the stone adapted for use in cement manufacture are the Trenton or Pelham limestone and the Bangor or Subcarboniferous. In close proximity to both these limestone formations are the shales of the Clinton, Subcarboniferous and Coal Measures.

At the present time there are two cement plants in North Alabama, namely, the Standard Portland Cement Co., located at Leeds in Jefferson County, and the Atlantic & Gulf Portland Cement Co., located at Ragland in St. Clair County. Both of these plants make use of the hard Trenton limestone, and the Standard Cement Co., according to Burchard of the U. S. Geological Survey, uses the shale of the Clinton formation whilst the Ragland Company makes use of the shales of the Coal Measures. Up to the present time no establishment is utilizing the Bangor limestone.

In Middle Alabama the soft, chalky Cretaceous limestone of the Selma Chalk, is the material utilized by the Alabama Portland Cement Co., at Spocari, near Demopolis. The same Company makes use of residual clays overlying and derived from the weathering of the Selma Chalk. During 1913 there was no production reported from the Demopolis plant.

In Southern Alabama the St. Stephens limestone outcropping east and west across the State, furnishes excellent material for Portland Cement manufacture, using either residual clays from decomposition of the limestone, or the clays of the Grand Gulf formation which are almost everywhere in close proximity to the limestone.

The following table summarizes the number of active plants in the United States, and the production of puzzolan cement during the last five years:

Statistics of the puzzolan cement industry, 1909-1913.

	1909	1910	1911	1912	1913
Number of plants reporting production:					
Alabama	1	1	1	1	1
New York*	.....	.....	1	1	1
Ohio	2	2	1	1	1
Pennsylvania	1	1	1	1	1
Total	4	4	4	4	4
Production in barrels of 330 pounds	160,646	95,951	93,230	91,864	107,313
Value of production	$99,453	$63,286	$77,786	$77,363	$97,663

*Includes production of Collos cement in 1911, 1912, and 1913.

Owing to the fact that there was in Alabama in 1913 only one producer of puzzolan cement, and not more than two operating plants in the Portland cement industry, it is necessary to combine the productions of both industries in order to avoid publishing figures which were given the Survey in confidence. The tabular results of such a combination are, however, necessarily inconsistent and not to be taken too literally, since the weights per barrel of the two kinds of cement vary.

The total quantity of Portland and puzzolan cement produced in Alabama in 1913 was 823,246 barrels, valued at $685,422 as compared with 726,688 barrels in 1912, valued at $608,620, or an increase in the production of 96,588 barrels, or 13.3 per cent, giving an increase in value of $76,802, or 12.6 per cent.

The percentages of increase in quantity and value are notably less than in 1912.

Below are presented in tabular form the foregoing figures.

Production and value of cement (including puzzolan and Portland) in Alabama in 1912 and 1913.

	No. of Producers	Quantity (Bbls.	Value	Percentage of total U. S. Value
1912	3	726,688	$608,620	0.91
1913	3	823,246	685,422	0.74
Increase	.....	96,558	76,802	.....
Percentage increase	.....	13.3	12.6	.....

CLAY AND CLAY PRODUCTS.

JEFFERSON MIDDLETON AND EUGENE A. SMITH.

CLAY.

CLAY available for the manufacture of clay products is one of the most widely spread of our minerals. Clay miners are usually also the manufacturers of the lower-grade clays, but as the higher grades of ware are reached, the rule is that fewer and fewer manufacturers are also miners, until in the highest grades of ware the rule is that the manufacturer is not the miner of the clays that he uses. The figures given in the following tables represent clay that is mined and not manufactured by the miner, but is sold as clay. The clay thus sold is small in quantity compared with that consumed and includes mainly clay used for refractory products.

The total quantity of clay mined in Alabama and sold as such in 1913 was 49,901 short tons, valued at $53,419. This was an increase in quantity of 6,849 tons, or 15.91 per cent, and of $20,005, or 59.87 per cent in value over 1912. While some miscellaneous clay was produced in 1913, fire clay was the only kind of which the figures of production are available for publication.

Below is a table giving the production and value of clay mined and sold in Alabama from 1909 to 1913 inclusive, and a comparison of the production of 1912 and 1913.

Production of clay in Alabama from 1908 to 1913 inclusive, and a comparison of the production in 1912 and 1913.

YEAR	Fire Clay		Miscellaneous Clay		Total	
	Quantity Short Tons	Value	Quantity Short Tons	Value	Quantity Short Tons	Value
1908	68,289	$48,983	24,000	$12,000	92,289	$60,983
1909	45,137	35,345	18,271	5,587	63,408	40,932
1910	54,482	32,395	20,600	5,650	75,082	38,045
1911	35,203	29,909	.....	.....	35,203	29,909
1912	38,552	31,414	4,500	2,000	43,052	33,414
1913	49,901	53,269	*	*	49,901	53,419
Increase 1913	11,049	21,855	.....	.....	6,849	20,005
Percentage of Increase	28.66	69.56	.....	.....	15.91	59.87

*Not divulged but included in total.

In 1912 the average value of fire clay was $0.81 per short ton and the fire clay production of Alabama represented 1.33 of the total value of the United States production. In 1913 the average value of Alabama fire clay was $1.07 per short ton, and the value of the Alabama product was 2.06 per cent of the total value of the fire clay produced in the United States.

CLAY WORKING INDUSTRIES.

ALABAMA is rich in clays, but its rank as a clay-working State is not high. In 1913 it was sixteenth among the States, with products valued at $2,091,581, or 1.15 per cent of the total for the country. This was an increase over 1912 of $156,402, or 8.08 per cent. In 1913 Alabama was ninth in the production and value of vitrified brick, and ninth in production and eleventh in value of fire brick. The principal product is common brick, valued in 1913 at $730,148, and representing 34.91 per cent of the value of all of Alabama's clay products in that year. Front brick, fireproofing, and tile, not drain, were reported to the value of $258,130, so that the structural materials represent nearly one-half of Alabama's clay products in 1913. The engineering products, vitrified paving brick, draintile, sewer pipe, and fire brick were reported to the value of $1,057,059, or more than 50 per cent of the total. Pottery clays are abundant in the State, but this branch of the industry has not been developed extensively, the value of pottery production in 1913, being only $20,158.

Jefferson County is the principal clay-working county, reporting a production valued at $1,313,432, or 62.8 per cent of the total value for 1913, an increase of $178,093 over 1912. No pottery was reported from this county. All of the fire brick produced in the State comes from Jefferson County, and fire brick is its principal product. Vitrified brick was reported only from Jefferson and St. Clair counties, the former being the leading county with 22,710,000 brick, valued at $339,615. The leading counties in the value of common brick in 1913 were, in the order of their importance, Montgomery, Talladega and Jefferson.

Clay products of Alabama, 1909-1913.

Product	1909	1910	1911	1912	1913
Brick:					
Common—					
Quantity	146,180,000	135,785,000	129,694,000	136,989,000	130,923,000
Value	$799,693	$746,961	$708,903	$759,409	$730,148
Average per M	$5.47	$5.50	$5.47	$5.54	$5.58
Vitrified—					
Quantity	20,444,000	19,772,000	21,444,000	26,480,000	24,183,000
Value	$262,376	$236,516	$246,707	$353,303	$361,722
Average per M	$12.83	$11.96	$11.50	$13.34	$14.96
Front—					
Quantity	(*)	(*)	9,169,000	10,629,000	(*)
Value	(*)	(*)	$128,403	$132,033	(*)
Average per M	$16.19	$15.96	$14.00	$12.42	$15.29
Fancy, value	(*)	.....	(*)	(*)	.....
Fire, value	$196,887	$163,672	$193,375	$240,434	(*)
Draintile, value	(*)	$3,773	$3,777	$5,465	$10,802
Sewer pipe, value	(*)	(*)	(*)	(*)	(*)
Fireproofing, value	(*)	(*)	(*)	(*)	(*)
Tile, not drain, value	.....	.....	.....	.....	(*)
Pottery:					
Red earthenware, value	$11,886	$3,475	$11,243	$10,990	$11,164
Stoneware and yellow and Rockingham ware, value	$24,453	$16,371	*$14,753	$11,223	$8,994
Miscellaneous, value	$404,832	$496,791	$639,941	$422,322	$968,751
Total value	$1,700,127	$1,667,559	$1,947,102	$1,935,179	$2,091,581
Number of active firms reporting	100	87	82	74	68
Rank of State	22	22	17	17	16

*Included in "Miscellaneous."

BRICK AND TILE.

THE total production of common brick in Alabama in 1913 was 130,923 M, valued at $730,148. This, as compared with the 1912 production, represents a decrease in both quantity and value, of 6,066 M, or 4.43 per cent, and of $29,261 or 3.85 per cent.

In the case of vitrified brick there was a decrease in quantity of 2,297 M, or 8.67 per cent. but an increase in value of $8,419, or 2.38 per cent. The other kinds of brick, including front, fire, fancy, sewer pipe, fire proofing and silica brick (produced by less than three manufacturers, and individual production therefore not available for publication), show an increase in value of $73,962, or 8.26 per cent.

The following tables give a review of the brick and tile industry in Alabama for 1912 and 1913:

Production of brick and tile in Alabama in 1913, not including pottery products.

Kind	Quantity per Thousand	Value	Average Value per Thousand	Percentage of total value of brick and tile	Percentage of total U. S. value
Common brick	130,923	$730,148	$5.58	35.25	1.46
Vitrified Brick	24,183	361,722	14.96	17.46	2.98
Drain Tile	.....	10,802	.....	0.52	0.12
Miscellaneous	.....	*968,751	.....	46.77	.....
Total	.....	$2,071,423	.....	100.00	1.97

*Includes front brick, fire brick, fancy brick, sewer pipe, fire-proofing, and silica brick.

Brick and tile production in 1912 and 1913 compared.

Kind	1912			1913			Increase or Decrease in Value	Percentage
	Quantity M	Value	Average Price	Quantity M	Value	Average Price		
Common Brick	136,989	$759,409	$5.54	130,923	$730,148	$5.58	—$29,261	3.85
Vitrified Brick	26,480	353,303	13.34	24,183	361,722	14.96	+ †8,419	2.38
Front Brick	10,629	132,033	12.42	*	*	15.29	.....	.....
Fire Brick	.....	240,434	.....	*	.....	.....	.....	.....
Drain Tile	.....	5,465	.....	.....	10,802	.....	+ †5,337	97.66
Miscellaneous	.....	*422,322	.....	.....	†968,751	.....	.....	.....

*Includes fancy brick, sewer pipe, fire proofing, and silica brick.

†Includes front brick, fire brick, fancy brick, sewer pipe, fire proofing, and silica brick.

POTTERIES.

THE pottery industry of Alabama is of relatively small importance, as only the commoner and coarser grades of ware are produced, and most of this for local trade only.

Production was reported for 1913 by 9 operators, a decrease of 6. The output was valued at $20,158, a decrease of $2,055, or 9.25 per cent. The products consisted of red earthen ware and stone ware only. There were five idle potteries in Alabama in 1913. The rank of Alabama in this industry for 1913 is 18.

The following tables show the values of pottery product in 1913 and a comparison of the production and values for the years 1912 and 1913:

Value of pottery products in 1913.

Kind	Value	Percentage of total Alabama Pottery's Products	Percentage of total U. S. Value
Red Earthenware	$11,164	55.40	1.12
Stoneware and Rockingham ware	8,994	44.60	0.24
Total	20,158	100.00	.05

Comparison of pottery products in 1912 and 1913.

Kind	1912	1913	Increase or Decrease	Percentage
Red Earthenware	$10,990	$11,164	+ $ 174	1.58
Stoneware and Rockingham ware	11,223	8,994	— 2,229	19.87
Total	22,213	20,158	— 2,055	9.25

COAL.

E. W. PARKER.

INTRODUCTORY.

THE great Appalachian coal region which furnishes over two-thirds of the coal production of the United States and which extends from Ohio and Pennsylvania on the north in a gradually narrowing belt through eastern Kentucky and Tennessee has its southern terminus in a considerably broadened area that occupies a large part of the northern half of Alabama. The coal-bearing formations of Alabama underlie about 8,400 square miles and are divided into four distinct basins, the Coosa, the Cahaba, and the Warrior, named from the rivers which drain them, and the Plateau, which includes Blount, Lookout, and Sand or Raccoon Mountains. By far the most important basin in area and in production in the Warrior, which includes all of Walker County, most of Jefferson, Tuscaloosa, and Fayette counties, and smaller parts of Blount, Cullman, Winston, and Marion counties. The area known to contain coal is approximately 4,000 square miles, or one-half the total coal area of the State, and contributes about 80 per cent of the total production.

There are several distinct coal groups in the basin, the most important of which are the Brookwood, the Pratt, and the Mary Lee, designated by the names of their principal beds. The Mary Lee group includes the Blue Creek, the Jagger, and the Newcastle beds, most of which are mined in places. The Brookwood, the Pratt, and the Mary Lee produce most of the coking coal mined in the State, and more than half of all of the coal mined in the district.

The Cahaba Basin, second in importance, is a long narrow syncline, 68 miles long and about 6 miles wide, southeast of the Warrior, and occupies parts of St. Clair, Jefferson, Shelby, and Bibb counties. There are many workable beds, and the total quantity of coal in the basin is large. The production is something over 10 per cent of the total for the State.

The Coosa Basin is a deep syncline east of the Cahaba and parallel with it, extending across Shelby and St. Clair counties. It is also long and narrow, 60 miles long by 6 miles wide. It has not been thoroughly explored, but in different parts of the area from two to twelve beds, 3 or more feet in thickness, have been reported.

The Plateau field embraces parts of Blount, Etowah, DeKalb, Cherokee, Marshall, and Jackson counties, and although it has an area underlain by coal four times that of the Cahaba and the Coosa combined, the resources in Alabama are comparatively small. There are four to six beds locally workable.

So far as known, the earliest record of the existence of coal in Alabama was made in 1834. The first statement of production in the State is contained in the United States census report for 1840, in which year the production is given as 946 tons. The census report for 1850 does not mention any coal production for the State, and the next authentic record is contained in the census statistics of 1860, when Alabama is credited with an output of 10,200 short tons. The mines of Alabama were probably worked to a considerable extent during the Civil War, but there are no records of the actual production until 1870, for which year the United States census reports a production of 11,000 tons. Ten years later the production had increased to 323,972 short tons, but the development of the present great industry really began in 1881 and 1882, when attention was directed to the large iron deposits near the city of Birmingham and thus the great "boom" of that city and vicinity was inaugurated. By 1885 the coal production of the State had increased to nearly 2,500,000 tons. Then followed a period of relapse and liquidation, which lasted two years, after which business settled down to a conservative and rational basis and has since developed steadily. In 1902 the coal production of the State reached a total of more than 10,000,000 tons, and reached the maximum of 17,678,522 tons in 1913.

PRODUCTION.

Total production in 1913, 17,678,522 short tons; spot value, $23,083,724.

The increase in coal production in Alabama in 1913 as compared with 1912 was 1,577,922 short tons, or 9.8 per cent, in

quantity and $2,254,472, or 10.8 per cent, in value. The average value per ton advanced from $1.29 to $1.31. The increased production in 1913 was due to several causes. During a part of 1912 some of the larger companies were in the hands of receivers and this condition cut down the possible output for that year. The production was further restricted by the burning of the tipple at one of the large mines. The tipple was not rebuilt until the early part of 1913. Several new mines were opened in 1913 and these have been furnishing a gradually increasing output. Some of the older mines have added improvements and extended their workings to provide for an increased tonnage. Labor conditions were much better in 1913 than in either 1912 or 1911, for, although in some districts there was a scarcity rather than a surplus, other districts reported a better labor supply, miners having been recruited from other lines of employment. Car shortage was less acute than in recent years prior to 1913, as some of the large coal-carrying roads have added materially to their facilities for handling the output. The increased tonnage went principally to points outside the State, as the demand for manufacturing, transportation, and domestic consumption within the State was not above normal. The most notable feature in the trade was the increased bunker requirements on the Gulf coast and larger shipments of coke to western points. The relations between operators and mine workers were generally harmonious and increased wages were put in force in February. Earnings by miners and mine laborers in 1913 are said to have been higher than ever before in the history of coal mining in Alabama. Improved sanitary and living conditions put into effect by many companies added to the general betterment.

The average tonnage per man for 1913 showed an increase over 1912 from 712 to 720, but there was a slight falling off in the average output per man per day from 2,91 to 2.82. The former was due to the larger number of days worked—255 in 1913 against 245 in 1912, and the latter partly to the amount of development work in progress during 1913 and partly to the larger number of new recruits. The number of men employed in 1913 was 24,552, against 22,613 in 1912.

The production by the use of machines increased from 3,742,549 short tons in 1912 to 4,124,301 tons in 1913, the

per centage to the total output being about the same in both years, 23.2 per cent in 1912 and 23.3 per cent in 1913. The number of machines increased from 353 to 377. Of the latter 249 were punchers, 42 chain breast, 20 long wall, and 66 short wall. It is unfortunate to be obliged to record a marked increase in the quantity and percentage of coal shot off the solid. In 1912 the quantity of powder-mined coal reported was 5,658,457, or 35.1 per cent of the total; in 1913 it was 7,052,234 tons, or 39.9 per cent. The hand-mined coal decreased from 6,658,732 tons, or 41.4 per cent, in 1912, to 6,315,787 tons, or 35.7 per cent, in 1913.

The statistics of fatal accidents compiled by the Bureau of Mines shows that there were 124 men killed in the coal-mining operations of Alabama in 1913, all but 1 underground. More than half of the deaths, 68 in all, were due to falls of roof and coal, 27 to gas and dust explosions (including suffocations by mine gases), and 19 to mine cars and locomotives. In 1912 there were 121 fatal accidents in Alabama coal mines. The death rate per thousand in 1913 was 5 against 5.4 in 1912, and the number of tons mined for each life lost was 142,569 against 133,063.

The total time lost by strikes in 1913 was 27,041 days, 1,048 men being idle for an average of 26 days.

Nearly one-half of the coal mined in Alabama in 1913 was washed before being marketed or used in the manufacture of coke. The quantity washed was 8,149,082 tons, yielding 7,210,588 tons of cleaned coal and 938,494 tons of refuse. The difference of 1.3 per cent between the production as reported to the Geological Survey and to the State mine inspector is probably due to the inclusion in the reports to the latter of some of the refuse and its omission in the reports to the Survey. The quantity of refuse actually reported to the Survey as removed at the mines and deducted from the gross tonnage was more than twice the difference between the Federal and State figures.

The statistics of production of coal in Alabama in 1912 and 1913, with the distribution of the product for consumption, are shown in the following table:

Coal production of Alabama in 1912 and 1913, by counties, in short tons.

1912.

County	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for steam and heat	Made into coke	Total quantity	Total value	Average price per ton	Average number of days active	Average number of employees
Bibb	1,662,198	9,823	109,314	.....	1,781,335	$2,621,682	$1.47	272	2,948
Blount	143,603	1,139	1,600	.....	146,342	181,036	1.24	211	282
Etowah	166,366	3,067	1,875	.....	171,308	249,749	1.46	265	260
Jefferson	6,168,715	81,368	339,211	1,585,555	8,174,849	10,433,728	1.28	251	10,922
St. Clair	722,276	2,456	25,021	.....	749,753	959,219	1.28	291	725
Shelby	463,788	3,501	29,660	.....	496,949	872,501	1.76	250	878
Tuscaloosa	631,114	12,038	48,863	188,952	880,967	1,091,882	1.24	239	1,220
Walker	3,271,284	32,030	102,681	141,967	3,547,962	4,158,094	1.17	211	5,079
Winston	18,550	105	75	.....	18,730	27,793	1.48	220	57
Other counties* and small mines	124,627	2,059	5,719	.....	132,405	233,568	1.76	229	242
Total	13,372,521	147,586	664,019	1,916,474	16,100,600	20,829,252	1.29	245	22,613

1913.

Bibb	1,802,243	9,214	99,569	.....	1,911,026	$2,979,240	$1.56	274	3,158
Blount	174,580	2,758	1,620	.....	178,958	236,448	1.32	203	354
Etowah	135,815	725	1,252	.....	137,792	171,600	1.25	256	209
Jefferson	7,149,844	83,353	412,891	1,382,746	9,028,834	11,790,737	1.31	266	11,643
St. Clair	861,579	2,909	25,891	.....	890,379	1,150,457	1.29	277	798
Shelby	457,313	4,469	35,787	.....	497,569	862,783	1.73	257	850
Tuscaloosa	699,690	13,891	68,836	134,888	917,305	1,172,227	1.28	271	1,183
Walker	3,671,708	42,809	101,760	150,986	3,967,263	4,481,373	1.13	223	6,031
Winston	24,841	60	50	.....	24,951	36,724	1.47	228	67
Other counties*	116,423	2,162	5,030	.....	123,615	200,059	1.62	233	259
Small mines	.....	830	.....	.....	830	2,076	2.50	.....	.....
Total	15,094,036	163,180	752,686	1,668,620	17,678,522	23,083,724	1.31	255	24,552

*Cullman, Jackson, and Marion.

In the following table is presented a statement of the production of coal in Alabama, by counties, during the last five years, with increase and decrease in 1913 as compared with 1912:

Coal production of Alabama, 1909-1913, by counties, in short tons.

County	1909	1910	1911	1912	1913	Increase (+ or decrease (−), 1913
Bibb	1,338,243	1,580,564	1,633,197	1,781,335	1,911,026	+ 129,691
Blount	}					
Cullman	} 186,261	*235,456	*210,070	*276,429	*300,092	+ 23,663
Etowah	46,194	172,465	255,860	171,308	137,792	− 33,516
Jefferson	7,176,922	8,298,702	7,776,390	8,174,849	9,028,834	+ 853,985
St. Clair	354,005	428,409	529,211	749,753	890,379	+ 140,626
Shelby	524,925	488,141	463,089	496,949	497,569	+ 620
Tuscaloosa	1,006,989	1,081,219	1,031,658	880,967	917,305	+ 36,338
Walker	2,973,776	3,788,479	3,103,595	3,547,962	3,967,263	+ 419,301
Winston	32,278	16,442	16,424	18,730	24,951	+ 6,221
Other counties and small mines	63,857	21,585	1,927	2,318	3,311	+ 993
Total	13,703,450	16,111,462	15,021,421	16,100,600	17,678,522	+ 1,577,922
Total value	$16,306,236	$20,236,853	$19,079,949	$20,829,252	$23,083,724	+$2,254,472

*Includes production of Marion County.

The statistics of production in Alabama from 1840 to the close of 1913 are shown in the following table:

Production of coal in Alabama from 1840 to 1913, in short tons.

Year	Quantity	Year	Quantity	Year	Quantity	Year	Quantity
1840	946	1859	9,000	1878	224,000	1897	5,893,770
1841	1,000	1860	10,200	1879	280,000	1898	6,535,283
1842	1,000	1861	10,000	1880	323,972	1899	7,593,416
1843	1,200	1862	12,500	1881	420,000	1900	8,394,275
1844	1,200	1863	15,000	1882	896,000	1901	9,099,052
1845	1,500	1864	15,000	1883	1,568,000	1902	10,354,570
1846	1,500	1865	12,000	1884	2,240,000	1903	11,654,324
1847	2,000	1866	12,000	1885	2,492,000	1904	11,262,046
1848	2,000	1867	10,000	1886	1,800,000	1905	11,866,069
1849	2,500	1868	10,000	1887	1,950,000	1906	13,107,963
1850	2,500	1869	10,000	1888	2,900,000	1907	14,250,454
1851	3,000	1870	11,000	1889	3,572,983	1908	11,604,593
1852	3,000	1871	15,000	1890	4,090,409	1909	13,703,450
1853	4,000	1872	16,800	1891	4,759,781	1910	16,111,462
1854	4,500	1873	44,800	1892	5,529,312	1911	15,021,421
1855	6,000	1874	50,400	1893	5,136,935	1912	16,100,600
1856	6,800	1875	67,200	1894	4,397,178	1913	17,678,522
1857	8,000	1876	112,000	1895	5,693,775		
1858	8,500	1877	196,000	1896	5,748,697	Total	254,954,358

The following tables give other details concerning the coal production of Alabama, including areas of the coal fields of Alabama and of the United States, with estimates of original and present supply, etc.; rank of first five coal-producing States; production by classes of mines; labor statistics; strikes and suspensions; machines used and methods of mining, etc.:

Area of coal fields of Alabama and of the United States, estimates of original and present supply, and the production to the close of 1913.

	Area	Estimated original supply	Production in 1913	Total production to close of 1913	Total exhaustion to close of 1913	Estimated available supply
	Sq. Mi.	Short Tons	Sh. Tons	Short Tons	Short Tons	Short Tons
Alabama	8,455	67,583,000,000	17,678,522	254,954,358	382,400,000	67,200,600,000
U. S.....	450,839	3,553,383,400,000	570,048,125	9,844,247,843	15,877,071.700	3,538,506,328,300

Rank of first ten coal-producing States in 1912 and 1913, with quantity and value of products and percentage of each.

1912.

Production				Value			
Rank	State or Territory	Quantity (short tons)	Percentage of total product'n	Rank	State or Territory	Value	Percentage of total value
1	Pennsylvania:			1	Pennsylvania:		
	Anthracite	84,361,598	15.8		Anthracite	$177,622,626	25.6
	Bituminous	161,865,488	30.3		Bituminous	169,370,497	24.4
2	West Virginia	66,786,687	12.5	2	Illinois	70,294,338	10.1
3	Illinois	59,885,226	11.2	3	West Virginia	62,792,234	9.0
4	Ohio	34,528,727	6.4	4	Ohio	37,083,363	5.3
5	Kentucky	16,490,521	3.1	5	Alabama	20,829,252	3.0
6	Alabama	16,100,600	3.0	6	Indiana	17,480,546	2.5
7	Indiana	15,285,718	2.8	7	Kentucky	16,854,207	2.4
8	Colorado	10,977,824	2.0	8	Colorado	16,345,336	2.4
9	Virginia	7,846,638	1.5	9	Iowa	13,152,088	1.9
10	Wyoming	7,368,124	1.4	10	Wyoming	11,648,088	1.7

1913.

Production				Value			
Rank	State or Territory	Quantity (short tons)	Percentage of total product'n	Rank	State or Territory	Value	Percentage of total value
1	Pennsylvania:			1	Pennsylvania:		
	Anthracite	91,524,922	16.1		Anthracite	$195,181,127	25.7
	Bituminous	173,781,217	30.5		Bituminous	193,039,806	25.4
2	West Virginia	71,308,982	12.5	2	West Virginia	71,872,165	9.5
3	Illinois	61,618,744	10.8	3	Illinois	70,313,605	9.2
4	Ohio	36,200,527	6.3	4	Ohio	39,948,058	5.3
5	Kentucky	19,616,600	3.4	5	Alabama	23,083,724	3.0
6	Alabama	17,678,522	3.1	6	Kentucky	20,516,749	2.7
7	Indiana	17,165,671	3.0	7	Indiana	19,001,881	2.5
8	Colorado	9,232,510	1.6	8	Colorado	14,035,090	1.8
9	Virginia	8,828,068	1.5	9	Iowa	13,496,710	1.8
10	Iowa	7,525,936	1.3	10	Kansas	12,036,292	1.6

Production of coal in Alabama in 1912 and 1913, according to classes of mines, in short tons.

1912.

	Mines		Production		
	Number	Percentage	Total	Average	per Mine
First Class: (Mines producing over 200,000 tons)	13	6.0	3,734,754	287,289	23.2
Second Class: (Mines producing from 100,000 to 200,000 tons)	50	23.0	7,364,764	147,295	45.7
Third Class: (Mines producing from 50,000 to 100,000 tons)	41	18.9	2,967,102	72,368	18.4
Fourth Class: (Mines prdoucing from 10,000 to 50,000 tons)	75	34.6	1,843,623	24,582	11.5
Fifth Class: (Mines producing less than 10,000 tons)	38	17.5	190,357	5,009	1.2
Total	217	.....	16,100,600	74,196	.....

1913.

First Class: (Mines producing over 200,000 tons)	19	8.5	6,112,051	321,687	34.6
Second Class: (Mines producing from 100,000 to 200,000 tons)	42	18.7	5,862,478	139,583	33.2
Third Class: (Mines producing from 50,000 to 100,000 tons)	44	19.6	3,121,545	70,944	17.6
Fourth Class: (Mines producing from 10,000 to 50,000 tons)	94	42.0	2,448,122	26,044	13.8
Fifth Class: (Mines producing less than 10,000 tons)	25	11.2	133,496	5,340	0.8
Total	224	.....	17,677,692	78,918	.....

Labor Statistics.

Statistics of labor employed in coal mines of Alabama 1908-1913.

Year	Number of days active	Average Number Employed
1908	222	19,197
1910	249	22,210
1911	227	22,707
1912	245	22,613
1913	255	24,552

Average production per man compared with hours worked per day, and average number of days worked 1910-1912.

Year	8 hours		9 hours		10 hours		All others	Total	Days Worked	Average Tonnage	
	Mines	Men	Mines	Men	Mines	Men	Men	Men		Per Year	Per Day
1910	18	766	36	2,633	134	17,306	1,525	22,230	249	725	2.91
1911	15	550	50	5,345	102	12,628	4,184	22,707	227	662	2.92
1912	11	338	46	4,145	107	13,938	4,192	22,613	245	712	2.91
1913	13	420	36	2,496	135	18,185	3,451	24,552	255	720	2.82

Statistics of labor strikes in the coal mines of Alabama in 1912 and 1913.

1912			1913		
Number of men on strike	Total days lost	Average number of days lost per man	Number of men on strike	Total days lost	Average number of days lost per man
384	12,323	32	1,048	27,041	26

Machines Used and Methods of Mining.

Number and kind of machines in use in Alabama in 1912 and 1913.

Year	Pick	Chain Breast	Long Wall	Short Wall	Total
1912	222	60	12	59	353
1913	249	42	20	66	377

Bituminous coal mined by machines in Alabama in 1912 and 1913.

Year	Number of machines in use	Number of tons mined by machines	Total tonnage of Alabama	Percentage of total product mined by machines
1912	353	3,742,549	16,100,600	23.2
1913	377	4,124,301	17,678,522	23.3

Quantity and percentage of coal mined by different methods in Alabama in 1912 and 1913, short tons.

Year	Mined by hand	Percentage	Shot off the solid	Percentage	Mined by machines	Percentage	Not reported	Percentage	Total production
1912	6,658,732	41.4	5,658,457	35.1	3,742,549	23.2	40,862	0.3	16,100,600
1913	6,315,787	35.7	7,052,234	39.9	4,124,301	23.3	186,200	1.1	17,678,522

Coal Washing Operations.

Coal washed at the mines in Alabama in 1912 and 1913, with quantity of washed coal and of refuse obtained from it, short tons.

Year	Quantity of coal washed	Quantity of cleaned coal	Quantity of refuse
1912	7,187,211	6,325,946	861,265
1913	8,149,082	7,210,588	938,494

Average Value of Alabama Coal.

Average value per short ton for coal at the mines in Alabama since 1908.

1908	1909	1910	1911	1912	1913	Advance in 1913
$1.26	$1.19	$1.26	$1.27	$1.29	$1.31	$0.02

COKE.

E. W. PARKER.

THE production of coke in Alabama increased from 2,975,489 short tons, valued at $8,098,412, in 1912, to 3,323,664 tons, valued at $9,627,170, in 1913. The gain was 348,175 tons, or 11.7 per cent, in quantity, and $1,528,758, or 18.9 per cent, in value. All of the increased production, and more, was in the output of retort oven or by-product coke. There are in Alabama four retort oven establishments with a total of 700 ovens, and in 1913 these establishments produced 2,022,959 tons of coke, or a little more than 60 per cent of the total output, whereas 22 active beehive plants with an aggregate of 4,135 ovens in blast produced 1,300,705 tons, or a little less than 40 per cent of the total. The average production per oven in the by-product plants was 2,890 tons, and the average production for each beehive oven was 315 tons.

The increase in the production of by-product coke in 1913 over 1912 was 673,162 tons, or nearly double the total increase. The output of beehive coke decreased 324,987 tons. The value of the by-product coke showed an increase of $1,751,538, or $222,780 more than the total increase, the difference representing the decrease in the value of beehive coke. Moreover, the average yield of coal in coke from the retort ovens was 71.4 per cent, whereas the average yield in the beehive ovens was 54.5 per cent. There is not the marked difference in the values of retort and beehive cokes (and in favor of the former) in Alabama as is shown in some States, for in Alabama the retort ovens, like the beehive, are located near the mines, and the two in that respect are somewhat on a parity, whereas in most of the States where retort coke is made the ovens are at considerable distances from the mines, and the transportation charges assessed against the coal are added to the value of the coke. In fact the Alabama, beehive coke had a higher value per ton in 1913 than the retort coke, the averages per ton being $3.38 for beehive coke and $2.58 for retort coke. The explanation of this seeming inconsistency lies in the fact that all of the retort

coke is used by the producers in their own furnaces, and the coke is charged to the furnaces at little more than cost, whereas the greater part of the beehive product is commercial coke, some of it for foundry use, and profits are included in the value.

That the beehive oven has had its day in Alabama and is on the decline is evinced by the facts that no new ovens of that type have been built in the last four years and that 20 establishments, with a total of 3,447 ovens, out of a total of 42 establishments, with 9,548 ovens, were idle in 1913, not counting the ovens out of blast at plants that produced some coke in 1913. There were fewer beehive ovens in existence in Alabama in 1913 than in 1908, five years before. The number of retort ovens increased from 620 in 1912 to 700 in 1913, 80 of the 100 ovens of that type reported as in course of construction at the close of 1912 having been completed and put in blast. The 700 completed ovens include 280 Semet-Solvay ovens (240 at Ensley and 40 at Tuscaloosa and 420 Koppers ovens (280 at Fairfield, formerly known as Corey, and 140 at Woodward). The only new ovens in course of construction at the close of 1913 were 20 Semet-Solvay ovens which were being added to the Tuscaloosa plant.

Rank of Coke-Producing States.

The record of coke production in 1913 effected few changes in the relative importance of the State in connection with that industry. Virginia superseded Colorado as sixth in rank, but with that exception the first 12 States held the same position in 1913 as in 1912. Pennsylvania, of course, stands preeminently first, with Alabama second, Indiana third, and West Virginia fourth, but if all the coke made from West Virginia coal were produced in that State it would be well fixed in second place, as by far the larger part of the coke manufactured in Ohio, Indiana, and Illinois is from West Virginia coal. As, however, the production of coke in retort ovens at or near the points of consumption is likely to continue to increase in greater proportion and the beehive ovens to disappear gradually from the mining regions, it is not probable that West Virginia will again assume its former importance as a coke-producing State.

The quantity of coke made in West Virginia in 1913 was less than one-half of that made from West Virginia coal in ovens outside the State.

The positions held by the coke-producing States are shown in the following table:

Rank of the States in production of coke, 1909-1913.

State	1909	1910	1911	1912	1913	State	1909	1910	1911	1912	1913
Pennsylvania	1	1	1	1	1	Tennessee	13	13	14	14	13
Alabama	3	3	2	2	2	Ohio	15	14	15	13	14
Indiana	22	17	6	3	3	Utah	16	16	17	15	15
West Virginia	2	2	3	4	4	Kentucky	19	20	19	18	16
Illinois	5	4	4	5	5	New Jersey	14	15	16	17	17
Virginia	4	5	7	7	6	Maryland	12	12	13	16	18
Colorado	6	6	5	6	7	Minnesota	17	18	18	19	19
New York	7	7	8	8	8	Washington	20	19	20	20	20
Wisconsin	8	8	9	9	9	Georgia	18	21	21	21	21
Massachusetts	9	9	10	10	10	Kansas	.....	24	22	22	.....
Michigan	11	11	12	11	11	Montana	21	22	.....	.....	.....
New Mexico	10	10	11	12	12	Oklahoma	.....	.....	23	.....	.....

The production of coke in Alabama in 1880, 1890, 1900, and annually from 1909 to 1913, is shown in the following table:

Statistics of the manufacture of coke in Alabama, 1880-1913.

Year	Establishments	Ovens		Coal used (short tons)	Yield of coal in coke (per cent)	Coke produced (short tons)	Total value of coke at ovens	Value of coke at ovens per ton
		Built	Building					
1880	4	316	100	106,283	57.0	60,781	$183,063	$3.01
1890	20	4,805	371	1,809,964	59.0	1,072,942	2,589,447	2.41
1900	30	6,529	690	3,582,547	58.9	2,110,837	5,629,423	2.67
1909	43	10,061	0	5,080,764	60.7	3,085,824	8,068,267	2.61
1910	43	10,132	340	5,272,322	61.6	3,249,027	9,165,821	2.82
1911	44	10,121	280	4,411,298	62.6	2,761,521	7,593,594	2.75
1912	46	10,208	100	4,585,498	64.9	2,975,489	8,098,412	2.72
1913	46	*10,284	†20	5,218,323	63.6	3,323,664	9,267,170	2.90

*Includes 280 Semet-Solvay and 420 Koppers ovens. †Semet-Solvay ovens.

coke is used by the producers in their own furnaces, and the coke is charged to the furnaces at little more than cost, whereas the greater part of the beehive product is commercial coke, some of it for foundry use, and profits are included in the value.

That the beehive oven has had its day in Alabama and is on the decline is evinced by the facts that no new ovens of that type have been built in the last four years and that 20 establishments, with a total of 3,447 ovens, out of a total of 42 establishments, with 9,548 ovens, were idle in 1913, not counting the ovens out of blast at plants that produced some coke in 1913. There were fewer beehive ovens in existence in Alabama in 1913 than in 1908, five years before. The number of retort ovens increased from 620 in 1912 to 700 in 1913, 80 of the 100 ovens of that type reported as in course of construction at the close of 1912 having been completed and put in blast. The 700 completed ovens include 280 Semet-Solvay ovens (240 at Ensley and 40 at Tuscaloosa and 420 Koppers ovens (280 at Fairfield, formerly known as Corey, and 140 at Woodward). The only new ovens in course of construction at the close of 1913 were 20 Semet-Solvay ovens which were being added to the Tuscaloosa plant.

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Indiana	22	17	6	3	3	Utah	16	16	17	15	15
West Virginia	2	2	3	4	4	Kentucky	19	20	19	18	16
Illinois	5	4	4	5	5	New Jersey	14	15	16	17	17
Virginia	4	5	7	7	6	Maryland	12	12	13	16	18
Colorado	6	6	5	6	7	Minnesota	17	18	18	19	19
New York	7	7	8	8	8	Washington	20	19	20	20	20
Wisconsin	8	8	9	9	9	Georgia	18	21	21	21	21
Massachusetts	9	9	10	10	10	Kansas	.....	24	22	22	.....
Michigan	11	11	12	11	11	Montana	21	22	.....	.....	.....
New Mexico	10	10	11	12	12	Oklahoma	.....	23	.....	.....	.....

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1912	46	10,208	100	4,585,498	64.9	2,975,489	8,098,412	2.72
1913	46	*10,284	†20	5,218,323	63.6	3,323,664	9,267,170	2.90

*Includes 280 Semet-Solvay and 420 Koppers ovens. †Semet-Solvay ovens.

Comparison of the production and value of coke in Alabama in 1912 and 1913.

	Number of ovens	Coal charged (short tons)	Coke produced (short tons)	Total value of coke at ovens	Percentage of total U. S. value
1912	10,208	4,585,498	2,975,489	$8,098,412	7.24
1913	10,284	5,218,323	3,323,664	9,627,170	7.46
Increase	76	632,825	348,175	1,528,758	.....
Percentage	0.74	13.8	11.7	18.9	.....

More than 80 per cent of the coal used in the manufacture of coke in Alabama is washed before being charged into the ovens. In 1913, out of a total of 5,218,323 tons of coal made into coke, 4,349,664 tons were washed. Of the washed coal used, 3,665,441 tons were slack and 684,223 tons were mine run. The unwashed mine-run coal used was 868,659 tons. No unwashed slack was used in 1913.

The character of the coal used in the manufacture of coke in Alabama in 1890, 1900, and for the last five years, is shown in the following table:

Character of coal used in the manufacture of coke in Alabama, 1890-1913, in short tons.

Year	Run of mine		Slack		Total
	Unwashed	Washed	Unwashed	Washed	
1890	1,480,669	0	206,106	123,189	1,809,964
1900	1,729,882	152,077	165,418	1,535,170	3,582,547
1909	713,992	2,153,801	0	2,212,971	5,080,764
1910	771,931	1,308,085	0	3,192,306	5,272,322
1911	693,135	1,295,109	2,937	2,420,117	4,411,298
1912	747,305	896,421	18,793	2,922,979	4,585,498
1913	868,659	684,223	0	3,665,441	5,218,323

Quantity and value of coal used in the manufacture of coke in Alabama in 1912 and 1913, and quantity and value of same per ton of coke.

Year	Coal used (short tons)	Total value of coal	Value of coal per ton	Quantity of coal per ton of coke (short tons)	Value of coal to a ton of coke
1912	4,585,498	$6,177,876	$1.35	1,541	$2,080
1913	5,218,323	7,609,963	1.46	1,570	2,292

Character of coal used in the manufacture of coke in Alabama in 1912 and 1913, in short tons.

Year	Run of mine		Slack		Total			
	Unwashed	Washed	Unwashed	Washed	Unwashed	Percentage	Washed	Percentage
1912	747,305	896,421	18,793	2,922,979	766,098	16.7	3,819,400	83.3
1913	868,659	684,223	0	3,665,441	868,659	16.6	4,349,664	83.4

Statistics of the production of coke in beehive and retort ovens in Alabama, 1912 and 1913.

Year	Beehive coke		By-product coke		Total	
	Quantity	Value	Quantity	Value	Quantity	Value
1912	1,625,692	$4,623,996	1,349,797	$3,474,416	2,975,489	$8,098,412
1913	1,300,705	4,401,216	2,022,959	5,225,954	3,323,664	9,627,170

Record of by-product ovens in Alabama 1909-1913.

Year	Built	Building
December 31, 1909	280	0
December 31, 1910	280	340
December 31, 1911	340	280
December 31, 1912	620	100
December 31, 1913	700	20

Complete list of retort coke-oven plants of Alabama, Jan. 1, 1914.

Town	System	Name of company owning plant	Number of installments	Date put in operation	Number of ovens	Uses of coke	Uses of surplus gas
Ensley (near Birmingham)	Semet-Solvay	Tennessee Coal, Iron & R. R. Co.	First	Oct., 1898	120	Blast furnace	Fuel
			Second	Mar., 1902	120	Blast furnace.	Fuel
Tuscaloosa	Semet-Solvay	Central Iron & Coal Co.	First	Feb., 1906	40	Blast furnace	Fuel
Woodward	Koppers	Woodward Iron Co.	First	1911	60	Blast furnace	Fuel and power
Woodward	Koppers	Woodward Iron Co.	Second	1913	80	Blast furnace	Fuel and power
Fairfield	Koppers	Tennessee Coal, Iron & R. R. Co.	First	1912	280	Blast furnace	Fuel and power

GOLD AND SILVER.

H. D. McCaskey.

THE mine production of gold in Alabama in 1913 was 536.67 fine ounces, valued at $11,094, and of silver 117 fine ounces, valued at $71, against 809.0 fine ounces of gold valued at $16,724, and 168 fine ounces of silver valued at $103, in 1912. The gold output was all from gold quartz mines and the silver production was entirely from refining the gold bullion produced. No copper, lead or zinc output was reported from Alabama in either 1912 or 1913.

The following table shows the mine production of gold and silver in Alabama since 1905, when the United States Geological Survey first collected detailed figures from the mines of the Eastern States. The decrease of production shows results from comparison with the corresponding Survey mine figures for 1912.

Production of gold and silver in Alabama from 1905 to 1913, inclusive.

	Ore Sold or Treated (short tons)	Gold		Silver		Total value
		Quantity oz.	Value	Quantity oz.	Value	
1905	16,425	2,009.0	$41,530	336	$203	$41,733
1906	8,565	1,137.0	24,921	124	83	25,004
1907	18,400	1,256.9	25,982	439	290	26,272
1908	11,174	1,993.4	41,208	282	149	41,357
1909	9,886	1,414.4	29,239	212	110	29,349
1910	9,763	1,662.2	33,533	268	145	33,678
1911	6,360	915.0	18,916	171	91	19,007
1912	5,693	809.02	16,724	168	103	16,827
1913	.....	536.67	11,094	117	71	11,165
Decrease in 1913	.....	272.35	5.630	51	32	5.662
Percentage	.....	33.66	33.66	30.36	31.07	33.65

GRAPHITE.

By Edson S. Bastin.

GRAPHITE is widely distributed among the metamorphic rocks of Alabama,[1] in which it occurs in two forms: (1) In the feebly crystalline schists which have been called the Talladega slates,[2] and which in part at least are Paleozoic sediments of as late age as the "Coal Measures," graphite is often found as a black graphitic clay free from grit. In this condition the graphite is difficult to separate from the other matter with which it is mixed, and the material has not yet been utilized commercially to any great extent. Examples of this mode of occurrence may be seen near Millerville, in Clay County, and about Blue Hill, in Tallapoosa County. (2) In the mica schists and other highly crystalline rocks graphite is found in the form of thin crystalline flakes, which may be separated from the associated minerals. Graphitic schists of this type are now being worked at three localities and have in the past been worked at several others.

Three graphite companies were active in Alabama during 1913. One of these, the Alabama Graphite Co., with mine and mill 6 miles west of Ashland, Clay County, reported a notable increase in production as compared with 1912. The other, the Quenelda Graphite Co. (formerly the Allen Graphite Co.), at Quenelda, Clay County, has completed a new mill to replace the one destroyed by fire in 1911. This mill was put in operation November 1, 1913, and an important quantity of flake graphite was marketed during the year. The mine and mill 4½ miles west of Ashland, formerly operated by the Ashland Graphite Co., have not been in operation since 1911, and it is reported that the company has dissolved. The Flaketown Graphite Co., near Mountain Creek, in Chilton County, reported an important production.

The properties of the Quenelda Graphite Co. and that formerly operated by the Ashland Graphite Co. and a few other

1 Smith, E. A., Min. Industry, vol. 16, p. 568, 1907.
2 McCalley, H., Alabama Geol. Survey Rept. valley regions, pt. 2, pp. 36-38, 1897.

Alabama graphite properties were visited by the writer in 1911. The original reports upon them being exhausted, his observations are reprinted below. The property of the Alabama Graphite Co. was not developed at that time and has not since been visited.

Clay County.

Ashland, the shipping point of the Clay County graphite properties, is the terminus of a short branch of the Atlanta, Birmingham & Atlantic Railroad. This branch is 7 miles long and joins the main line at Pyriton. The freight rate on refined graphite from Ashland to New York City is about $7 a long ton.

Quenelda Graphite Co. (Formerly the Allen Graphite Co.)

The quarry and mill of this company are located a little over 8 miles west of Ashland, at a settlement shown on the United States Geological Survey's map of the Ashland quadrangle under the name "Graphite." The mine is about half a mile from the mill, with which it is connected by a tramway. The concentrate is hauled over a fairly good road to Ashland for shipment. The mining is entirely from open pits, and because of the decomposed character of the rock can be accomplished largely with the aid of pick, shovel, and crow-bar, without much drilling and blasting.

The main pit is about 450 feet in length, 100 feet in average width, and about 60 feet in maximum depth. A small pit just east of the main pit and on the same graphitic band is about 100 feet long, 90 feet wide, and 25 feet deep. A third pit has been opened on the same band of graphitic schist about 1,000 feet east of the main pit on the west face of another hill. This is about 90 feet wide, about 200 feet long, and about 40 feet deep. The strike of the schist at the north end of the main pit is N. 80° E., with a dip of 75° S. This is fairly typical for the deposit as a whole.

The rock mined is highly schistose and is composed largely of quartz and graphite. A white, fibrous mineral, probably sillimanite, is also abundant. Feldspar and mica are rare. Few of the thin graphite flakes so far seen by the writer exceed 2 millimeters across and most of them are under 1½ millimeters. They are arranged subparallel to one another, and to this arrangement and a similar orientation of the sillimanite (?) prisms is largely due the schistosity of the rock. At the west end of the main pit a dike of coarse granite, 1 to 1½ feet wide, parallels the foliation of the schist, and in the easternmost pit the graphitic schist has also been intruded by an irregular body of coarse granite pegmatite carrying muscovite crystals up to 3 inches across. The graphitic beds here are also disturbed by faulting. The contact metamorphic effects of these small intrusions on the graphitic schist appear to be slight.

The mill which was in operation at the time of the writer's visit has since been destroyed by fire and replaced by a new one, but as the old mill was studied in some detail a description of the process may still be of value.

The milling process in the old mill was divided into three principal stages—(1) crushing and drying; (2) preliminary wet concentration; and (3) final dry concentration.

The most important step in the milling process was the preliminary concentration by water flotation. In these concentrators the dry crushed rock was spread in a thin stream upon the surface of slowly flowing water. The graphite being flaky was supported by the surface tension of the water and floated off, while the granular gangue, mainly quartz, sank and was sent to the dump. The process is cheap where water is plentiful. The tailings seen on the dump carried surprisingly little graphite; that which was present was usually attached to other minerals. Much fine grit, of course, floated off with the graphite but was removed in the final dry concentration.

The crude rock was said by the operators to average about 5 per cent graphite. For two successive years (September, 1908, to September, 1910) the finished product formed, respectively, 2.95 and 2.7 per cent by weight of the crude rock treated. Four principal grades were produced, whose relative proportions were about as follows:

Grades of flake graphite produced by Allen Graphite Co., Clay County, Alabama.

		Per cent.
Grade C.	Crucible flake	36
Grade 1.	Lubricating flake (coarse)	11
Grade 2.	Lubricating flake (fine)	18
Grade D.	Dust for foundry facings, etc.	35
		100

The highest grade averaged over 90 per cent graphite; the dust average about 50 per cent graphite. The average prices f. o. b. New York in 1911 were: Grade C, 6½ cents per pound; grade 1, 5½ cents per pound; grade 2, 4½ cents per pound; and grade D, 1 cent per pound.

Ashland Graphite Co.

The quarry and mill of the Ashland Graphite Co., which has not been a producer since 1911, are located about 4½ miles west of Ashland. The company was the successor to the Enitachopco Graphite Co. The product of the plant was hauled by team to Ashland. The workings at this property consist of two open pits located in the same belt of graphite schist. The two pits are on neighboring knolls, and the mill is in the small valley between them. The largest or eastern pit is about 400 feet long, 30 to 50 feet wide, and 50 feet deep. It follows along the strike of a band of graphitic schist which averages about 30 feet in width, though broadening locally to about 50 feet. The strike is about N. 55° E. and the average dip is about 45° E. The second pit, located west of the mill, is about 150 feet long, 20 feet wide, and about 20 feet deep. The trend of the schists is similar to that at the larger pit.

The graphitic rock at this quarry is similar in general to that at Quenelda quarry. The schist is too much decomposed for the complete identification of all the minerals, but quartz is the principal component. As a rule mica is rare, but the brown mica biotite is common in a few places. The graphite forms thin flakes, mostly under 1 millimeter in diameter, although some reach 2 millimeters. No igneous rocks were seen in association with the graphitic schist at this property. The rock being more or less decomposed, can be excavated with pick

and crowbar with occasional blasting. It is loaded into tramcars and hauled to the mill.

Coosa County.

A graphite prospect is located about 2 miles northwest of Goodwater, a station on the Central of Georgia Railway. At this locality a large number of small prospect pits are scattered over an area of several acres, and nearly all show graphitic quartz schist. The prospects are on a steep southwest hillside overlooking the iron bridge where the wagon road from Goodwater to Pine Grove crosses Hatchet Creek. The rock is gray when fresh and highly schistose and strikes nearly east and west, with a dip of about 45° S. It is almost identical in character with the graphitic schist worked in Clay County and consists largely of quartz and graphite, the latter in flakes mostly under 1 millimeter in diameter. Very little mica is present. An analysis of a composite sample of graphitic schist collected from a large number of pits on this property showed 2 per cent of graphite, but in certain portions the percentage will undoubtedly be greater. The deposit is unquestionably a large one and its situation on a steep hillside would afford opportunity to work to a considerable depth by open-pit methods. The neighboring Hatchet Creek could furnish abundant water for wet concentration of the graphite.

A second deposit, probably of similar character, has been prospected between Mount Olive and Hollins. It was not visited by the writer, but is said to be of considerable size.

Production and vaule of crystalline graphite in 1912 and 1913.

	Quantity Pounds	Value	Percentage of total U. S. quantity	Percentage of total U. S. value
1912	534,100	$21,364	6.95	9.68
1913	2,020,910	87,336	29.73	29.73
Increase	1,486,810	65,972	.....	.....
Percentage	278.38	308.80	.....	.....

IRON ORE.

EUGENE A. SMITH.

IRON ores of Alabama in the order of their economic importance are (1) red ore or hematite; (2) the brown ore or limonite; (3) the gray ore. The black band and clay iron stone have been noticed as occurring in a number of places, but only the red ore and the brown ore have been mined on any large scale.

Practically all the ore mined in Alabama is smelted in the State, the shipments out of the State being about equal to those received from other states.

The tables given below will show the rank of Alabama among the States of the Union both in the production of iron ore and in pig iron.

RED ORE OR HEMATITE.

Practically all the ore of this quality mined in Alabama occurs in the Clinton or Red Mountain formation. The Red Mountain ridges occur on each side of the anticlinal valleys which separate the coal fields. In places the red ore ridges are lacking on one side, usually the western, of the valleys being cut out by faults, while on the other hand the ridge may be duplicated on one side of the valley by the same faults.

In most of the valley occurrences the moderate dips of the ore bed are on the eastern side and there are also practically all of the ore mines. Murphrees Valley makes an exception to this, the moderate dips and the iron mines being on the western side. The iron ore occurs mainly in the central part of the formation in seams or beds one to five in number, which vary in thickness from a few inches to thirty feet.

While the ore seams are very persistent along the outcrop which in Alabama must be as much as 50 miles, yet they vary greatly from place to place, being either too thin or too lean for profitable working in the greater part of this distance.

The most important development of the Clinton ore in this State and in the world is along the 15 or 16 miles stretch of the east Red Mountain between Birmingham and Bessemer, and there is a practically continuous series of mines and strippings for this entire distance. Much mining of this ore has also been done near Gate City, Village Springs, Attalla, Gadsden, Round Mountain, Gaylesville, Ft. Payne, Valley Head, etc.

The completion in October, 1912, of a diamond drill boring in Shades Valley, within a mile of the base of Shades Mountain, gives a definite answer to the speculations concerning the occurrence of red ore under Shades Valley. This boring shows that there is no falling off in the thickness and quality of the ore with distance from the outcrop, and that the depth of the ore below the surface at a distance of more than 2½ miles from the outcrop on Red Mountain is not too great for shaft mining.

The elevation of the surface at the drilling is 595 feet. The top of the ore was reached at a depth of 1,902 feet and a section of the seam in descending order is:

Ore (Self-fluxing)	9 ft. 6 in.
Shale	4 in.
Ore (Siliceous)	9 ft. 6 in.

An analysis of an average sample of the drill of the core of the upper bench, made by David Hancock, shows as follows:

	Per Cent.
Metallic iron	39.51
Silica	9.94
Alumina	3.34
Calcium Carbonate	24.20
Magnesium carbonate	.78
Metallic manganese	.20
Phosphorus	.32

The importance of this demonstration of a vast increase in the amount of red ore available immediately or in the near future, cannot well be overestimated.

In 1913 the Gulf States Steel Company acquired about 1,500 acres of land upon which the drill hole above mentioned was located. They commenced sinking double track slope to the ore, and the work is now about half completed (December, 1914). No serious difficulties have been encountered so far and it is probable that in about a year they will have reached the ore. In time this is likely to be the largest producing mine in the district.

Another drill hole was put down in Shades Valley in 1913 in the S. E. ¼ of the S. E. ¼ of section 19, township 19, range 3 W., but the records are not available for publication at the present time.

The hematite production of Alabama for 1913 was 4,370,823 long tons as against 3,814,361 tons for 1912, an increase for 1913 of 556,462 tons or 14.58 per cent. This 1913 production of hematite is 83.58 per cent of the total iron ore production of the State, and 7.05 per cent of the total iron ore production of the United States.

The average price per long ton of hematite in Alabama in 1912 was $1.16; in 1913, $1.18.

Brown Ore or Limonite.

This ore, the second in importance in the State and in the United States, furnished only 2.54 per cent of the total iron ore produced in the United States in 1913. The entire limonite production of the United States in 1913 was 1,577,019 long tons, of which Alabama contributed 844,917 tons, or 53.58 per cent. and the State holds, accordingly, the first rank in this industry.

In the early days of iron making and up to the year 1876 this was the only ore used in the catalan forges, bloomaries, and charcoal furnaces of the State. It was then demonstrated that good iron could be made at low cost from the red ores, with coke for the fuel.

In general the limonites are considered the best of the ores of Alabama and they command the highest prices and command a ready sale.

The usual mode of occurrence is in irregular masses of concretionary origin in the residual clays resulting from the de-

composition of limestones, and as a consequence the mining is uncertain and expensive. Limonite also occurs in regularly stratified seams or beds, and then it is the result of the alteration of pyrites or of carbonate ores. Practically all of the brown ore actually mined is that occurring in the residual clays above mentioned. Most of the ore before going to the furnace is washed and screened, and this manipulation, together with the cost of mining, makes it the most expensive of the iron ores, and it is therefore seldom used alone, but is usually mixed with the red ore in porportions determined by the quality of the iron desired. It is used alone in the charcoal furnaces and also in the coke furnaces when a particularly tough pig iron is wanted.

The limonite deposits are very numerous and are distributed over a broad expanse of country and in many places are known to be very extensive. In some of the deposits the ore is in nearly solid mass, in others it is much scattered, and in consequence the amount of foreign material necessary to be moved for every ton of ore produced, varies very much, not only in the different ore banks but also in the different parts of the same bank.

The deposits occur in nearly all the geological formations of the State, but in most of these the ore is either insufficient in quantity or not pure enough to be of much commercial value. The most important of the deposits, in point of extent and value, occur overlying the following formations, viz., the Knox Dolomite and the Weisner Quartzite, the Lauderdale Chert of the Lower Carboniferous, and the Lafayette. Some extensive beds of ore of inferior quality generally occur also in the Tuscaloosa formation of the Cretaceous, and in the upper part of the Lower Carboniferous and in the Metamorphic rocks.

The limonite or brown ore production of Alabama for 1913 was 844,917 long tons as against 749,242 tons in 1912, an increase of 95.675 tons or 12.77 per cent. The average price per long ton of iron ore marketed in Alabama in 1913 was $1.43; in 1913, $1.61.

The following tables show details concerning the production of iron ore in the State, together with the rank of the State in mined and in marketed iron ore, 1912 and 1913.

Iron ore mined in Alabama in 1912 and 1913, by varieties, with percentage of increase in 1913, in long tons.

Year	Hematite	Brown Ore	Total Quantity	Percentage of total U. S. produc'n.
1912	3,814,361	749,242	4,563,603	8.27
1913	4,370,823	844,917	5,215,740	8.42
Increase	556,462	95,675	652,137	.....
Percentage of increase 1913	14.58	12.77	14.29	.....

Iron ore marketed in Alabama in 1912 and 1913, by varieties, in long tons.

Year	Hematite	Brown Ore	Total Quantity	Total Value
1912	4,012,901	763,644	4,776,545	5,734,371
1913	4,488,176	845,042	5,333,218	6,648,569
Increase	475,275	81,398	556,673	914,198
Percentage of increase	11.84	10.67	11.66	15.94

Rank of first five states in mined and marketed production of iron ore in 1912 and 1913.

1912.

Rank	State	Mined		Marketed			
		Quantity (long tons)	Percentage of total production	Quantity (long tons)	Percentage of total production	Value	Percentage of total value
1	Minnesota	36,431,768	62.43	34,249,813	60.07	$61,805,017	57.74
2	Michigan	11,191,430	20.29	12,797,468	22.44	29,003,163	27.09
3	Alabama	4,563,603	8.28	4,776,545	8.38	5,734,371	5.36
4	New York	1,216,672	2.21	1,167,405	2.05	2,933,026	2.74
5	Wisconsin	860,600	1.56	1,152,250	2.02	2,731,574	2.55

1913.

1	Minnesota	38,658,793	62.37	36,603,331	61.37	80,789,025	61.72
2	Michigan	12,841,093	20.72	12,668,560	21.24	33,479,954	25.58
3	Alabama	5,215,740	8.42	5,333,218	8.94	6,648,569	5.08
4	New York	1,459,628	2.36	1,420,889	2.38	3,100,235	2.37
5	Wisconsin	1,018,272	1.64	896,243	1.50	2,149,397	1.64

Iron ore mines of Alabama that produced more than 50,000 long tons each in 1913.

Name of Mine	Nearest Town	Variety of Ore	Quantity
1. Red Mountain Group	Bessemer	Hematite	2,205,196
2. Woodward, 1, 2 and 3	Lipscomb	Hematite	586,010
3. Songo	Songo	Hematite	184,118
4. Raimund, No. 1	Bessemer	Hematite	183,638
5. Steinman	Steinman	Hematite	147,313
6. Greeley	Greeley	Brown Ore	127,006
7. Raimund, No. 2	Bessemer	Hematite	117,556
8. Crudup	Gadsden	Hematite	91,001
9. Ironaton	Ironaton	Brown	87,637
10. Raimund, No. 3	Bessemer	Hematite	67,903
11. Houston	Rickey	Brown	67,815
12. Docray	Docray	Brown	67,771
13. Tannehill	Goethite	Brown	62,503
14. Friedman	Woodstock	Brown	56,244
15. Spaulding	Birmingham	Hematite	56,192
16. Attalla	Attalla	Hematite	55,593
Total (16 mines)			4,163,496
Unspecified* (4 mines)			829,197
Tonnage from 20 mines producing more than 50,000 long tons each			4,992,693
Tonnage from 20 mines producing less than 50,000 long tons each			223,047
Grand total of Alabama production			5,215,740

*Includes the product of 4 mines, producing over 50,000 tons each, operated by 2 companies which do not permit the publication of individual statistics.

PIG IRON.

Quantity and value of pig iron, (exclusive of ferro-alloys) marketed in the United States in 1912 and 1913, (first five States), with increase or decrease and percentage of increase or decrease in 1913, in long tons.

State	1912		1913		Increase (+) or decrease (−) in 1913		Percentage of increase (+) or decrease (−) in 1913	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Pennsylvania	12,437,685	$181,569,299	12,871,349	$197,726,314	+433,664	+16,157,015	+ 3.49	+ 8.90
Ohio	7,127,176	93,140,369	6,913,961	103,824,517	−213,215	+10,684,148	− 2.90	+ 11.47
Illinois	2,806,378	42,828,816	2,892,263	45,796,966	+ 85,885	+ 2,968,150	+ 3.06	+ 6.93
New York	1,373,090	28,059,058	1,967,449	30,203,673	− 5,641	+ 2,144,615	− .29	+ 7.64
Alabama	1,987,753	21,371,053	1,924,762	23,242,374	− 62,991	+ 1,871,321	− 3.17	+ 8.76

Production of pig iron, (including ferro-alloys) in 1912 and 1913, (first five States), in long tons.
Bureau of Statistics of American Iron & Steel Institute.

State	1912			1913	
	Rank	Quantity	Percentage	Quantity	Percentage
Pennsylvania	1	12,552,131	42.23	12,954,936	41.84
Ohio	2	6,802,493	22.88	7,129,525	23.02
Illinois	3	2,887,359	9.71	2,927,832	9.45
New York	4	1,939,231	6.52	2,065,825	6.67
Alabama	5	1,862,681	6.27	2,057,911	6.65

LIME.

EUGENE A. SMITH.

DURING the year 1913 there was a falling off in the production of lime in Alabama as compared with the production of the preceding year. The total product of 12 operators in 1913 was 75,468 short tons, a decrease from the 1912 production of 4,489 short tons or 5.61 per cent. The value of the product was $290,394, a decrease of $7,393, or 2.48 per cent.

The most important use of the lime produced is for building purposes. 40.66 per cent of the State's total production is definitely so credited, while of the 48.74 per cent distributed by dealers and uses not specified a large proportion undoubtedly goes for building purposes so that probably 50 per cent or more of the product is thus used. Other chief uses for lime are in chemical works, paper mills, soap factories, sand-lime brick, slag cement, etc.

In the total above given is included hydrated lime produced at two plants only so that exact figures showing this production cannot be given.

Shelby county as heretofore was the largest producer in 1913, having produced 48,953 short tons, or about 65 per cent

of the total. The other producers in the order of their rank were Etowah, Blount, Calhoun and DeKalb.

The following tables present some additional data on the lime production in Alabama in 1912 and 1913:

Production of lime, 1912 and 1913.

	Number of operators	Quantity (short tons)	Rank of State by quantity	Value	Rank of State by value	Average price per ton	Percentage of total U. S. value
1912	13	79,957	14	$297,178	17	$3.72	2.13
1913	12	75,468	16	290,394	16	3.85	1.98
Decrease		— 4,489		— 6,784			
Percentage		5.61		2.28			

Number of lime kilns in Alabama using various kinds of fuel in 1912 and 1913.

Year	Coal	Wood	Coal and Wood	Total Number of Kilns
1912	16	9	27	52
1913	18	0	30	48

Those interested in the subject of lime are referred to an article on lime by Ralph W. Stone of the U. S. Geological Survey, and on the Source, Manufacture, and Use of Lime, by E. F. Burchard and Warren E. Emley of the U. S. Geological Survey, published in Vol. II of the Mineral Resources of the United States for the year 1913.

MICA.

THERE was no production of mica in Alabama during the year 1912, but there was a small production in 1913, but as there was only one producer the figures showing the production cannot be given.

The resources of the State as regards mica are given in the statistical report for 1912. Many important details concerning the production of mica may be found in the Second Volume of Mineral Resources of the United States, in an article by Mr. Douglas B. Sterrett of the U. S. Geological Survey.

MINERAL WATERS.

R. B. DOLE.

RETURNS from Alabama indicate that the mineral-water trade in 1913 was practically the same as in 1912. The sales amounted to 169,687 gallons, or 4,009 gallons more than in 1912, and the value of the output was $19,343, or $1,092 less than in 1912 . The average price reported was 11 cents a gallon, against an average of 12 cents in 1912. Fourteen springs reported sales; one spring active in 1912 was idle in 1913, and one spring's output, which was not reported, was estimated on the basis of the sales in 1912. There was some decrease in the sale of medicinal waters, but an appreciable increase in the sale of table waters, so that trade in the latter found the greater part of the business. Five bathing establishments and resorts accommodating nearly 1,500 guests at 9 springs were maintained. In addition to the quantity reported as sold, 70,000 gallons of mineral water was used in the manufacture of soft drinks.

The following 14 springs reported sales:

Alabama Mineral Springs, McWilliams, Wilcox County.
Bailey Springs, Florence, Lauderdale County.
Bladon Springs, Bladon Springs, Choctaw County.
Blount Springs, Blount Springs, Blount County.
Bromberg Gulf Coast Lithia Spring, Bayou La Batre, Mobile County.
Dixie Spring, Dixie Spring, Walker County.
Healing Springs, Healing Springs, Washington County.
Ingram Lithia Wells, near Ohatchee, Calhoun County.
Livingston Spring Livingston, Sumter County.
Luverne Mineral Spring, Luverne, Crenshaw County.
MacGregor Spring, Spring Hill, Mobile County.
Matchless Mineral Wells, east of Greenville, Butler County.
Purity Spring, Spring Hill, Mobile County.
White Sulphur Wells, near Jackson, Clarke County.

The following table shows the relative productions and their respective values for 1912 and 1913.

Production and value of mineral waters in 1912 and 1913.

	No. of springs reporting	Quantity sold (gallons)	Average retail price	Total value of mineral waters	Percentage of total U. S. value
1912	16	165,678	$0.12	$20,435	0.31
1913	15	169,687	0.11	19,343	0.34
Increase or decrease	− 1	+ 4,009	.....	− 1,092	.....
Percentage	.....	2.42	.....	5.34	.....

OCHER.

JAMES M. HILL.

OCHER is a hydrated ferric oxide permeating a clay base. It has a specific gravity of about 3.5 and a decidedly golden-yellow color. As viewed under the microscope and with considerable enlargement the particles composing ocher appear flocculent and uniform. Good grades should contain 20 per cent or more of iron oxide, though there is a wide variation in the iron content of the material sold as ocher. Ferruginous shale is often ground and the product marketed as ocher, but unless the material is actually an ocher, as defined above, such product is classed under slate and shale in this chapter.

In 1913 ocher was produced in Georgia, Pennsylvania, Virginia, Alabama, California, Iowa, and Vermont, the States being named in the order of their producing importance. The Georgia output, practically all of which came from the vicinity of Cartersville, Bartow County, was 65 per cent of the total production of the United States. Mines located in Berks, Northampton, and Lehigh counties, Pa., produced a little over 22 per cent of the ocher mined in the country. In Virginia the production was as usual from Page and Pulaski counties. Alabama re-entered the class of ocher producers, a new mine being opened in Clarke County.* The ocher mines of Stanislaus and Calaveras counties, Cal., were worked to a limited extent, and it seems possible, according to trade reports, that the deposits near Michigan Bar, Sacramento County, may be re-opened.

Ocherous clays and true ocher are not unusual in most parts of the country. The Survey is constantly in receipt of samples of yellow material, some of which would undoubtedly make good paints, but many of which are certainly not salable for use as pigments. During the year promising deposits have been opened in Utah, California, and Wisconsin, and several samples have been received from new workings in the old Virginia field.

*There are many promising deposits of ocher in Alabama, especially in the area of the Tuscaloosa formation of the Cretaceous, as well as in other parts of the Coastal Plain southward nearly to the Gulf. E. A. S.

NATURAL GAS.

By B. Hill.

NATURAL gas was produced commercially in Alabama in Fayette, Madison, and Walker counties in 1913, there being a total of 340 domestic and 2 industrial consumers supplied in the towns of Fayette, Jasper, and West Huntsville. Jasper was first supplied with gas in 1913, and this is one of the features that mark the progress of the natural-gas industry in this State. As compared with 1912, the number of consumers supplied in 1913 was more than double, and the income derived from sale of gas was proportionately increased.

Considerable effort has been made and much money spent in trying to find an important oil or gas field in Alabama; the results have not been very encouraging, but the prospectors are hopeful, and the work continues. The gas wells in the Fayette and Walker County fields are holding up very well. The number of productive gas wells in the State at the close of 1913 was 18. One well was flooded and abandoned, but an effort will be made to bring it back, and there is a chance that it may yet be a producer. During 1913 there were 7 dry holes drilled in Alabama, 1 in Fayette County, 1 in Morgan County, 4 in Walker County, and 1 in Winston County.

The depth of the productive gas wells in Alabama varies from 300 to 2,400 feet and the pressure from 25 to 800 pounds.

The statistics of the gas production in this State are included with those of Louisiana.

SAND AND GRAVEL.

THE total production of sand and gravel in the State in 1913 was 1,405,068 short tons valued at $398,008, as compared with 852,943 tons valued at $268,111 in 1912, an increase in quantity of 552,125 tons or 64.73 per cent, and an increase in value of $129,977, or 48.48 per cent.

There was an increase in the quantity of sand of 21,686 short tons or 6.11 per cent, but a decrease in value of $767 or 0.6 per cent.

In the quantity of gravel there was an increase of 106.55 per cent, and in the value, of 92.83 per cent.

Over 76 per cent of the sand was used for building purpose.

The following tables give a comparison of production of sand and gravel in 1912 and 1913, and the production, value and disposition of the sand in these two years.

Productions in short tons of sand and gravel in 1912 and 1913.

	Sand		Gravel		Total*		Percentage of total U. S. value
	Quantity	Value	Quantity	Value	Quantity	Value	
1912	355,111	$127,250	497,832	$140,861	852,943	268,111	1.16
1913	376,797	126,483	1,028,271	271,605	1,405,968	398,088	1.64
Increase or decrease	+21,686	— 767	+ 530,439	+130,744	+ 552,125	+129,977	.....
Percentage	6.11	.60	106.55	92.83	64.73	48.48	.....

*Chert has been added to these totals.

Production (in short tons), value and kinds of sand in 1912 and 1913.

	Molding Sand		Building Sand		Grinding & Polishing Sand		Paving Sand		Engine Sand		Other Sand		Total	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1912	51,107	$25,284	205,498	$66,586	.....	.....	37,801	$14,997	45,000	$13,300	15,705	$7,983	355,111	$127,250
1913	57,798	23,368	288,346	90,347	25,903	$11,118	2,750	1,250	.....	.....	2,000	499	376,797	126,483
Increase or decrease	+6,691	−1,916	+82,848	+23,761	.....	.....	−35,051	−13,747	.....	.....	−13,705	−6,683	+21,686	− 767
Percentage	13.09	7.58	40.32	35.69	.....	.....	92.72	91.67	.....	.....	87.26	94.35	6.11	.69

STONE.

E. F. Burchard.

THE figures presented in the following report have to do with the stone produced and sold by the quarrymen and include only such manufactured product as is put on the market by the quarrymen themselves. This applies especially to rough and dressed building stone, dressed monumental stone, crushed stone, flagstone, curbstone, and paving block. The value given to this manufactured product is the price received by the producer, free on board at point of shipment, and includes therefore the cost of labor necessary to dress the stone. The stone reported as sold rough includes stone sold as rough stock to monumental works, and to cut-stone contractors for building purposes; stone sold as riprap, rubble, and flux; and includes the value of only such labor as is required to get the stone out of the quarry in the shape required by the purchaser. The value given to this stone is the price received by the quarryman free on board at point of shipment. In case the stone is sold to local trade the value is given as the quarryman sells the material, generally at the quarry, but in some cases delivered, if this is done by the producer. In some instances a long haul to market or to the railroad increases the cost of the material, and therefore of the selling price.

Production.

By Eugene A. Smith.

Alabama produces commercially only three kinds of stone, namely, limestone, marble, and sandstone.

The total value of production of stone in Alabama showed an increase in 1913 of more than 52 per cent. The greater part of this increase was in the limestone production, $281,579 or 53.01 per cent. The sandstone showed a larger per cent of increase, viz., 447.58, though the increase in actual value was less, viz., $123,515. The value of the marble produced also

increased in a notable way, but exact figures cannot be given since there were less than three producers.

The following table gives some additional details concerning the total stone production.

Total value of stone (limestone, sandstone and marble) produced in Alabama in 1913. Percentage of total U. S. value, rank of State and number of plants.

Year	Total value	Percentage of total U. S. value	Number of plants	Rank of State
1912	$ 842,300	1.08	26	27
1913	1,285,944	1.54	55	20
Increase 1913	443,644			
Percent increase	52.64			

LIMESTONE.

The most important use of the limestone produced in Alabama in 1913 as in 1912 was for furnace flux, while crushed stone for concrete, and stone for riprap follow next in importance. The very great increase in the percentage of crushed stone used for concrete is the most striking feature in the stone production for the year. There was a very decided falling off in the value of the limestone used for paving, and a decrease less pronounced in the crushed stone used for road making and for railroad ballast. For the first time in many years a production of building stone, rough and dressed, is reported, and the use of limestone for agricultural purposes makes a welcome beginning.

The limestone burned into lime or used in the manufacture of Portland cement is not taken account of here, but is included in the value of each of the finished products in whose manufacture it was used.

As thus limited the total value of the limestone produced in 1913 was $812,664, as compared with $531,085 in 1912, an increase of $281,579 or 43.01 per cent.

The values of the limestone produced in 1912 and 1913, classified according to the uses of the stone, are given in the following table:

Value of limestone (not including marble) produced in 1912 and 1913, according to uses.

Use	1912	1913	Increase or Decrease	Percentage
Rough Building		$9,517	+ $9,517	
Dressed Building		27,020	+ 27,022	
Paving	$15,900	189	— 15,711	98.81
Rubble		188	+ 188	
Riprap	81,361	58,850	— 22,511	27.67
Crushed Stone:				
Road making	54,270	47,237	— 7,043	12.98
R. R. ballast	14,093	7,187	— 6,906	49.00
Concrete	26,235	168,195	+141,860	540.73
Flux	339,166	487,078	+147,912	43.61
Agricultural	60	7,203	+ 7,143	
Total	531,085	812,664	+281,579	53.01

Limestone for Building Purposes.

Eugene A. Smith.

The preparation of cut stone for building purposes in Alabama, while on the increase, is not yet what it should be. Practically all of this material comes from the quarries in the subcarboniferous limestone of the Tennessee Valley, the most important quarries being at Rockwood in Franklin County, operated by Foster-Creighton-Gould Co., of Nashville. This stone is quite similar in appearance, composition, and other qualities to the Indiana stone, and so far as experience in the use of the stone from the two localities in the buildings of the University of Alabama goes, the Alabama stone holds its own under influence of the weather better than does the Indiana stone. Stone steps, door sills, and window sills, buttress caps, etc., of the Alabama stone put in place in 1885 show practically no deterioration in color and wear under foot, and in crumbling and roughening under the influence of the weather, which cannot be said of some portions of the Indiana stone used in buildings erected in 1909-10. The Rockwood quarries have most modern and approved methods of machinery for sawing the stone and handling it in transit

to the mills and elsewhere. The stone is of massive formation, of great thickness and extent. Blocks weighing as much as 25 tons, without crack or flaw, are not infrequently quarried, the size of the blocks being practically limited only by the capacity of the hoisting machinery.

The Oolitic variety is most extensively used for building and monumental work. It is of light gray color, uniform grain, and homogeneous texture. It possesses a quality of cheapness, it can be cut to any design required, and is at the same time strong and durable.

With the installing of adequate machinery at the quarry for doing the finished work, there should never be any longer any reason for going outside of the State for this quality of stone. Already the material has been very extensively used in public buildings in Mississippi, Tennessee, as well as in Alabama. The only reason why it was not used in the recently erected buildings at the University of Alabama was that at the time these building contracts were let, the quarries furnished only the rough sawn stone and there was not in Alabama any establishment adequately equipped for the dressing of the stone in the quantity needed.

Marble.

Eugene A. Smith.

The marble of Alabama is of two kinds, crystalline or true marble and non-crystalline.

The crystalline or statuary marble occurs mainly in a narrow valley along the western border of the metamorphic area, extending from Marble Valley in Coosa County, through Talladega into Calhoun. The length of the marble belt through Coosa and Talladega counties is about 50 miles. The width of the valley carrying the marble as a rule is from one quarter to one-half mile, widening in places to a mile and a quarter, for example in the neighborhood of Sylacauga.

The quarries longest known are Gantt's and Herd's near Sylacauga, Nix's near Sycamore, Bowie's near Rendalia, and Taylor's and McKenzie's near Taylor's Mill, east of Talladega. From all of these marble was quarried before the civil war.

During 1913 only two companies reported any marble production, viz., the Alabama Marble Company, at Gantt's Quarry and the Moretti-Harrah Company, whose quarry adjoins Gantt's.

The Alabama Marble Quarries of the Scott Brothers near Sycamore and the Eureka Quarry near Talladega Springs are in course of development and will report production in 1914.

The plant of the Alabama Marble Company at Gantt's Quarry which was completely destroyed by fire in December, 1910, has been rebuilt and equipped with all the machinery needed for the working up of any kind of finished product.

I think it is fairly safe to say that on the whole the marble from this quarry and immediate vicinity is of the highest grade of commercial white marble now on the market and obtainable in large quantity. There are small quantities of marble produced both in Italy and Vermont that are somewhat freer from coloring matter than the best grades that can be produced in Alabama in any quantity. But on the other hand, the poorest grades in Alabama greatly surpass the poorest grades produced elsewhere, so that the average of the Alabama deposit is probably somewhat higher than that of any other so far developed, not excluding even the marble from the Carara district in Italy. The marble from this State (Gantt's Quarry) has now a well established reputation and has been used in more than 200 important buildings throughout the United States.

It can be seen in the galleries of the National Museum in Washington.

A beautiful quality of variegated limestone or marble—red, pink and white—belonging probably to the Cambrian formation, occurs in Shelby County a mile or two south of Shelby Springs station on the L. & N. railroad, and extending thence southwest for a mile or two. Nothing but prospecting work has been done on this marble. The Trenton limestone in the Appalachian valleys, particularly Jones Valley below Bessemer, contains marble similar to that quarried in the vicinity of Knoxville, Tenn. Also as to Pratt's ferry on the Cahaba River in Bibb County a quarry was for many years worked in this formation and turned out a very beautiful quality of marble varying in color from gray through pink, red and brown shades.

A black marble which is exceedingly promising, has been reported and some development work done near Anniston, and at Piedmont, Calhoun County, and some very handsome specimens of cave onyx have been obtained from near Kymulga in Talladega County.

In the Coastal Plain the St. Stephens limestone of the Tertiary holds ledges of hard, almost crystalline rock capable of taking good polish. The colors vary from nearly white, through shades of yellowish into red, and it would make a handsome decorative marble, especially for inside work.

Other limestone formations, such as the Subcarboniferous and the Knox Dolomite, could in places be drawn upon for marble.

No figures of production of marble can be given as there were only two companies reporting. The greater part of the product was used for interior decoration.

SANDSTONE.

As may be seen in the tables below, the production of sandstone in 1913 shows a very marked increase in value along every line and particularly in the crushed stone used in concrete. The total value of the sandstone production of 1913 was $151,111, as compared with $27,596 in 1912, an increase of $123,515, or 629.1 per cent.

Value of sandstone production in Alabama from 1909 to 1913.

Year	1909	1910	1911	1912	1913
Value	$77,327	$109,063	$73,195	$27,596	$151,111

Value of sandstone production in Alabama in 1912 and 1913, according to uses.

Uses	1912	1913	Increase or Decrease	Percentage
Rough Building		$37,500	+$37,500	
Ganister	$45		— 45	
Rubble	$4,866	9,055	+ 4,189	86.09
Riprap	10,685	17,056	+ 6,371	59.62
Crushed Stone:—Concrete	12,000	87,500	+ 75,500	629.17
Total	27,596	151,111	+123,515	447.58

SUMMARY.

BECAUSE of the difference in the units of measurement employed in the various branches of the mineral industry, a summation of the production of the year can include only the values of the products. It is also to be noted that a simple summation of all the values of the minerals or mineral products listed in this pamphlet would give a value much in excess of the true value, since in many cases, as, for instance, coal and coke, and iron ore and pig iron and steel, the second product is directly a product of the first, and the value of the first is included in that of the second. To give the values of both as a part of the total would be to repeat, in a measure, at least a partial value of the first or raw product, and would give an erroneous result.

As the Survey has not, however, the figures upon which to base an estimate as to the percentage of each product which was used in the manufacture of some other product, the summation of the mineral production of the State, as given here, will be a simple summation of the values reached by the individual branches of the industry.

According to this rather unsatisfactory manner of summation, which does not include the value of the steel produced, the value of the 1913 raw mineral and immediately derived products was $67,530,089, as compared with $60,141,793 in 1912, an increase of $7,388,296, or 12.28 per cent. This production may be classified as follows:

Raw products	$34,660,545
Pig iron	23,242,374
Coke	9,627 170
Total	67,530,089

The more important mineral products after coal, pig iron and coke, in the order of their value, are iron ores, clay products, stone, cement, sand and gravel, and lime.

Below is a tabular presentation of the value of the mineral productions as estimated above for 1910, 1911, 1912 and 1913:

Total value of the mineral production and products in Alabama in 1910, 1911, 1912, and 1913.

Year	Value
1910	$63,207,945
1911	52,772,951
1912	60,141,793
1913	67,530,089